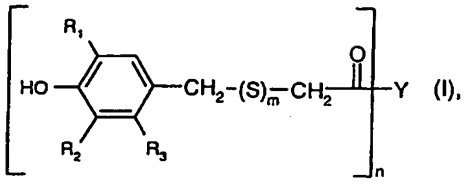
Claims

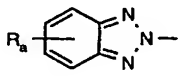
1. A process for the preparation of a compound of the formula:



(I),

wherein

one of R_1 and R_2 independently of one another represents hydrogen, a substituent selected from the group consisting of C_1-C_{18}alkyl, phenyl, (C_1-C_4alkyl)$_{1-3}$phenyl, phenyl-C_1-C_3alkyl, (C_1-C_4alkyl)$_{1-3}$phenyl-C_1-C_3alkyl, C_5-C_{12}cycloalkyl and (C_1-C_4alkyl)$_{1-3}$$C_5$-$C_{12}$cycloalkyl or a group of the partial formula:



(A),

wherein

R_a represents hydrogen or a substituent selected from the group consisting of C_1-C_4alkyl, halogen and sulpho;

and the other one of R_1 and R_2 represents a substituent selected from the group consisting of C_4-C_{18}alkyl, phenyl, (C_1-C_4alkyl)$_{1-3}$phenyl, phenyl-C_1-C_3alkyl, (C_1-C_4alkyl)$_{1-3}$phenyl-C_1-C_3alkyl, C_5-C_{12}cycloalkyl and (C_1-C_4alkyl)$_{1-3}$$C_5$-$C_{12}$cycloalkyl or a group of the partial formula (A);

R_3 represents hydrogen or methyl;

m represents zero or 1; and

n represents a numeral from 1 to 4; and,

if n represents 1,

m represents zero or 1, Y represents the monovalent groups –O-Y_1 or –N(-Y_2)$_2$, wherein Y_1 is selected from the group consisting of C_5-C_{45}alkyl, C_3-C_{45}alkyl interrupted by at least one O-heteroatom, C_5-C_{12}cycloalkyl, C_2-C_{12}alkenyl,

-CH_2-CH(OH)-CH_2-O-C(=O)-R_b (B),

wherein

R_b represents hydrogen or a substituent selected from the group consisting of C_1-C_8alkyl, C_3-C_5alkenyl and benzyl and

$$-CH_2-CH_2-O-R_c \qquad (C),$$

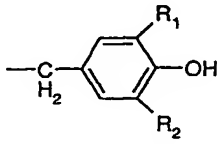
wherein

R_c represents hydrogen or a substituent selected from the group consisting of C_1-C_{24}alkyl, C_5-C_{12}cycloalkyl, phenyl,

$$-CHR_d-CHR_e-C(=O)-O-R_f \qquad (C_1),$$

wherein

one of R_d and R_e represents methyl and the other one represents methyl and R_f represents hydrogen or C_1-C_{24}alkyl,



(C_2),

wherein R_1 and R_2 are as defined above, and

$$-CH_2-C(=O)-O-R_f \qquad (C_3),$$

wherein R_f is as defined above; and,

Y_2 represents hydroxy-C_2-C_4alkyl;

if n represents 2,

m represents zero, Y represents a bivalent group selected from the group consisting of

$$-O-C_xH_{2x}-O- \qquad (D),$$

wherein x is a numeral from 2 to 20,

$$-O-(CH_2-CH_2-O)_y-CH_2-CH_2-O- \qquad (E),$$

wherein y is a numeral from 1 to 30,

$$-O-CH_2-CH_2-S-CH_2-CH_2-O- \qquad (F),$$

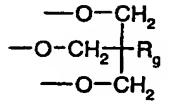
$$-O-CH_2-CH=CH-CH_2-O- \qquad (G); \text{ and}$$

$$-NH-(CH_2)_z-NH- \qquad (H),$$

wherein z represents zero or a numeral from 2 to 10; and

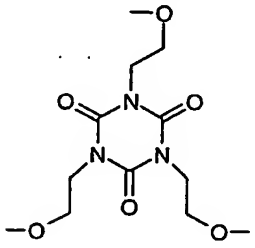
if n represents 3,

m represents zero and Y represents a trivalent group selected from the group consisting of



(K),

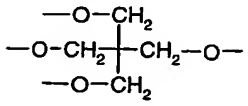
wherein R_9 represents C_1-C_{24}alkyl or phenyl, and



(L),

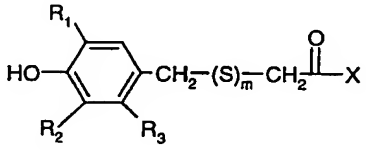
and, if n represents 4,

m represents zero and Y represents a tetravalent group of the partial formula:



(M),

characterised in that in a compound of the formula:



(II),

wherein

R_1, R_2, R_3 and m are as defined above and –X represents a reactive leaving group, the group -X is replaced by enzymatic catalysis with a mono-, bi-, tri- or tetravalent group -Y that corresponds to the value of the numeral n,

if n represents 1 with the monovalent group $-O-Y_1$ or $-N(-Y_2)_2$; or,

if n represents 2, with one of the bivalent groups (D), (E), (F), (G) or (H) ; or,

if n represents 3, with the trivalent group of the partial formulae (K) or (L); or,

if n represents 4, with the tetravalent group of the partial formula (M).

2. A process according to claim 1 for the preparation of a compound (I), wherein

one of R_1 and R_2 represents methyl, tert-butyl or the group (A), wherein R_a represents hydrogen or chloro, and the other one of R_1 and R_2 represents tert-butyl;

R_3 represents hydrogen;

m represents zero or 1; and

n represents a numeral from 1 to 4; and,

if n represents 1, m represents zero or 1, and Y represents the monovalent groups -O-Y_1 or -N(-Y_2)$_2$;

if n represents 2, m represents zero, and Y represents the bivalent groups (D), (E), (F), (G) or (H); or,

if n represents 3, m represents zero, and Y represents the trivalent group of the partial formulae (K) or (L); or,

if n represents 4, m represents zero, and Y represents the tetravalent group of the partial formula (M), *characterised in that* the process steps of claim 1 are carried out.

3. A process according to claim 1 for the preparation of a compound (I), wherein

one of R_1 and R_2 represents methyl, tert-butyl or the group (A), wherein R_a represents hydrogen or chloro, and the other one of R_1 and R_2 represents tert-butyl;

R_3 represents hydrogen;

m represents zero or 1; and

n represents a numeral from 1 to 4; and,

if n represents one, m represents zero or one, and Y represents the monovalent groups -O-Y_1 or -N(-Y_2)$_2$;

wherein Y_1 is selected from the group consisting of C_5-C_{45}alkyl and C_3-C_{45}alkyl interrupted by at least one O-heteroatom and Y_2 represents hydroxy-C_2-C_4alkyl; and,

if n represents 2,

m represents zero, Y represents a bivalent group selected from the group consisting of

$$-O\text{-}C_xH_{2x}\text{-}O- \qquad (D),$$

wherein x is a numeral from 2 to 20,

$$-O-(CH_2-CH_2-O)_y-CH_2-CH_2-O- \qquad (E),$$

wherein y is a numeral from 1 to 30,

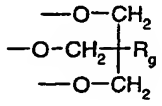
$$-O-CH_2-CH_2-S-CH_2-CH_2- \qquad (F),$$

$$-NH-(CH_2)_z-NH- \qquad (H);$$

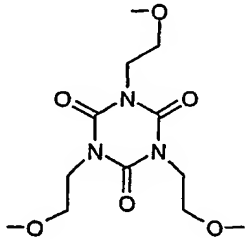
wherein z represents zero or a numeral from 2 to 10; and,

if n represents 3,

m represents zero and Y represents a trivalent group selected from the group consisting of

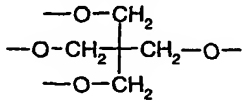

(K),

wherein R_9 represents C_1-C_{24}alkyl, and


(L),

and, if n represents 4,

m represents zero and Y represents a tetravalent group of the partial formula:


(M),

characterised in that the process steps of claim 1 are carried out.

4. A process according to claim 1 for the preparation of a compound (I), wherein

one of R_1 and R_2 represents methyl, tert-butyl or the group (A), wherein R_8 represents hydrogen or chloro, and the other one of R_1 and R_2 represents tert-butyl;

R_3 represents hydrogen;

m represents zero or 1; and

n represents a numeral from 1 to 4; and,

if n represents one, Y represents the monovalent groups –O-Y_1 or –N(-Y_2)$_2$;

wherein Y_1 is selected from the group consisting of C_5-C_{20}alkyl and C_3-C_{20}alkyl interrupted by at least one O-heteroatom and Y_2 represents hydroxy-C_2-C_4alkyl; and,

if n represents 2,

m represents zero, Y represents a bivalent group selected from the group consisting of

–O-C_xH_{2x}-O- (D),

wherein x is a numeral from 2 to 10,

-O-(CH_2-CH_2-O)$_y$-CH_2-CH_2-O- (E),

wherein y is a numeral from 1 to 10,

-O-CH_2-CH_2-S-CH_2-CH_2- (F),

-NH-(CH_2)$_z$-NH- (H);

wherein z represents zero or a numeral from 2 to 10; and,

if n represents 3,

m represents zero, and Y represents the trivalent group (L); and, if n represents 4, m represents zero and Y represents a tetravalent group (M),

characterised in that the process steps of claim 1 are carried out.

5. A process according to claim 1 for the preparation of a compound (I), wherein

one of R_1 and R_2 represents methyl or tert-butyl and the other one of R_1 and R_2 represents tert-butyl;

R_3 represents hydrogen;

m represents zero or 1; and

n represents a numeral from 1 to 4; and,

if n represents 1, Y represents the monovalent groups –O-Y_1 or –N(-Y_2)$_2$;

wherein Y_1 is selected from the group consisting of C_5-C_{20}alkyl and C_3-C_{20}alkyl interrupted by at least one O-heteroatom and Y_2 represents hydroxy-C_2-C_4alkyl; and,

if n represents 2,

m represents zero, Y represents a bivalent group selected from the group consisting of

–O-C_xH_{2x}-O- (D),

wherein x is a numeral from 2 to 10,

$$-O-(CH_2-CH_2-O)_y-CH_2-CH_2-O- \quad (E),$$

wherein y is a numeral from 1 to 10,

$$-O-CH_2-CH_2-S-CH_2-CH_2- \quad (F),$$

$$-NH-(CH_2)_z-NH- \quad (H);$$

wherein z represents zero or a numeral from 2 to 10; and,

if n represents 3,

m represents zero, and Y represents the trivalent group (L); and, if n represents 4, m represents zero and Y represents a tetravalent group (M),

characterised in that the process steps of claim 1 are carried out.

6. A process according to claim 1 for the preparation of a compound (I), wherein

R_1 represents tert-butyl;

R_2 represents the group (A), wherein R_4 represents hydrogen or chloro;

R_3 represents hydrogen;

m represents zero;

n represents 1; and

Y represents the monovalent group $-O-Y_1$;

wherein Y_1 is selected from the group consisting of C_5-C_{20}alkyl and C_3-C_{20}alkyl interrupted by at least one O-heteroatom,

characterised in that the process steps of claim 1 are carried out.

7. A process according to claim 1, characterised in that the reactive leaving group –X in a compound (II) is a methoxy group.

8. A process according to claim 1, characterised in that the enzymatic catalysis is carried out with an enzyme selected from the group consisting of esterase, lipase and protease.

9. A process according to claim 1, characterised in that the enzymatic catalysis is carried out with enzymes immobilised on a support material or carrier, to which they are linked chemically or physically.

10. A process according to claim 1, characterised in that the mono-, bi-, tri- or tetravalent group Y that corresponds to the value of the numeral n is derived,

if n represents 1, from an alcohol HO-Y_1 or an amine HN(-Y_2)$_2$;

if n represents 2, from a dihydroxy alcohol selected from the group consisting of

$$HO\text{-}C_xH_{2x}\text{-}OH \qquad (D'),$$

wherein x is a numeral from 2 to 20,

$$HO\text{-}(CH_2\text{-}CH_2\text{-}O)_y\text{-}CH_2\text{-}CH_2\text{-}OH \qquad (E'),$$

wherein y is a numeral from 1 to 30,

$$HO\text{-}CH_2\text{-}CH_2\text{-}S\text{-}CH_2\text{-}CH_2\text{-}OH \qquad (F') \text{ and}$$

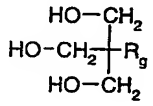
$$HO\text{-}CH_2\text{-}CH{=}CH\text{-}CH_2\text{-}OH \qquad (G');$$

from hydrazine or a diamino compound

$$NH_2\text{-}(CH_2)_z\text{-}NH_2 \qquad (H'),$$

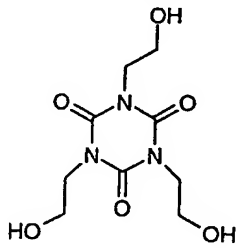
wherein z represents zero or a numeral from 2 to 10; and,

if n represents 3, from a trihydroxy alcohol Y selected from the group consisting of



(K'),

wherein R_g represents C_1-C_{24}alkyl or phenyl, and



(L),

and, if n represents 4, from pentaerythritol.

11. A composition comprising

a) a compound (I), wherein R_1, R_2, R_3, m, n and Y are as defined in claim 1; and

b) an enzyme catalyst that catalyzes in a compound (II) the removal of the reactive leaving group –X with a mono-, bi-, tri- or tetravalent group –Y.